EPIC Calibration Factors

Revision 1

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Alexander Marshak

NASA/GSFC

Code 613

Jay Herman

UMBC

Code 614

Goddard Space Flight Center
Greenbelt, Maryland

National Aeronautics and Space Administration

1 EPIC CALIBRATION CONVERSION FACTORS

The EPIC level 1 A & B data products contain images in engineering units of counts/second. The following document provides the information on the preliminary factors to convert the data into reflectance.

There are two ways to derive the EPIC calibration: 1) light reflected from the Moon or the Earth can be expressed in radiance units (Watts/(m^2 nm sr)) or 2) light reflected from the earth can be expressed in reflectance (πI/F),where I is the measured radiance at the top of the atmosphere and F(λ) is the incident solar irradiance (W/(m^2 nm)) convolved with the instrument response function R(λ) for each wavelength channel. To convert from one form to the other, the solar flux used must be specified both as a weighted instrument response function $F_N = \int R_N(\lambda) F_N(\lambda) d\lambda / \Delta\lambda_N$ for each filter channel N of width $\Delta\lambda$ as a high resolution solar spectrum F(λ) for each channel that uses a spectrally resolved absorption cross section to produce a science product (e.g., O_3, SO_2). Some of the calibration methods (e.g., comparisons with MODIS or NPP/OMPS measured reflectance) directly yield a conversion K(λ) between EPIC counts/sec and reflectance. Both the MODIS and NPP/OMPS reflectance "measurements" contains a satellite specific measured solar irradiance for their respective channels.

Table Best Estimates of Calibration Factors K(λ) as of 6/28/2016

Wvl (nm)	K(λ)
318 OMPS	1.31×10^{-4}
325 OMPS	1.21×10^{-4}
340 OMI	2.00×10^{-5}
388 OMI	2.70×10^{-5}
443 MODIS	0.88×10^{-5}
551 MODIS	0.69×10^{-5}
680 MODIS	1.00×10^{-5}
688 MOON	2.16×10^{-5}
764 MOON	2.52×10^{-5}
780 MODIS	1.50×10^{-5}

For simplicity calibration coefficients are expressed as a conversion from counts per second to reflectance (see Table). At present, only the constant calibration factors $K(\lambda)$ are provided. However, there are also small biases and time dependencies that will be discussed after the stray light correction (in version 2). Note, the accuracy of the preliminary factors $K(\lambda)$ may not be better than 3-4%.

Preliminary UV Validation: Calibration coefficients for 443 nm and UV channels (317.5, 325, 340 and 388 nm) can be evaluated against quantitative products such as ozone amount, and surface reflectivity. The results can also be checked by requiring that aerosol index residuals = 0 over regions that do not have aerosols, and where other sources of spectral dependence (i.e., surface effects) are well characterized. Figure 1 shows a comparison of derived EPIC ozone compared to the OMPS Nadir Mapper ozone. Note that the comparison with OMPS ozone is for 13:30±1 hour local time with a narrow band from EPIC's values from sunrise to sunset.

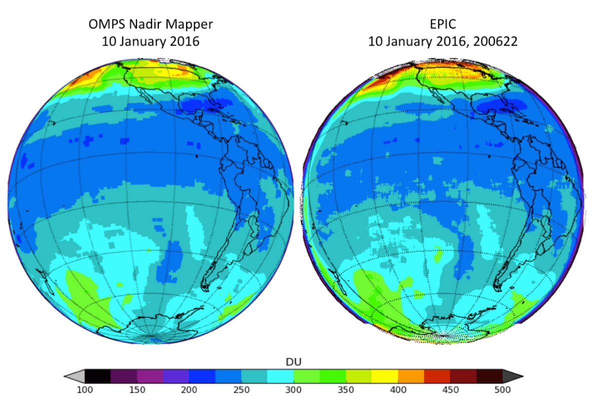

Figure 1 The global distribution of ozone obtained from EPIC at reduced spatial resolution (right) using K(325) and K(340) compared to the ozone field obtained from Suomi/OMPS. A similar analysis has been done using 317.5 nm and 340 nm with nearly